

## The further explanation of demand supply curve in microeconomics

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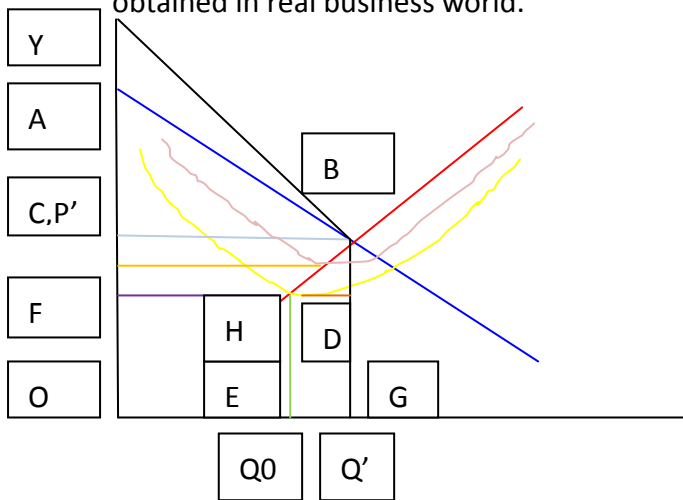
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### Abstract

The demand supply curves represent the fundamental economics principles. However, there is lacking detailed relationship between company and the microeconomics when we apply this demand-and-supply curve. Thus, here, I propose a detailed explanation of microeconomic demand-and-supply curve to put material cost and labor cost in the graph. Thus, a more practical demand-supply graph can be obtained in real business world.



### Text

Here, I will propose a new microeconomic demand-and-supply model shown in the following picture. Thus, the demand-supply curve can be more practical in real business world.

In the above graph, we can see the longterm demand curve is the blue line(MB curve: Marginal Propensity to Consume: MPC) and the longterm supply curve is the red line(MC curve, wage rate curve). B point is the equilibrium point. BY is 45 degree line, so the area YAB is equal to saving due to definition ( $1-MPC=MPS$ ). The yellow line is the average variable cost and the pink line is the average total cost. Since this is the microeconomics curve, the supply line (marginal cost) line just begins from the bottom of D point (above average total cost). The consumer surplus is the area ABC(consumption). The producer surplus is the area BCFH which is the profit plus total fixed cost(assets). The total revenue is area BCOG. Here, we will see the

material cost is the area DGFO. It is because the material cost is in the linear relationship with each quantity of good produced. The labor cost is equal to the marginal cost line (red line). It is the wage rate and it is because the labor cost is in inverse relationship to the marginal productivity. The more workers are, the decreased productivity trend is. Thus, the labor cost is BDH triangle. The ladder area between dark yellow line and light blue line is the profit. The ladder area between dark yellow line and purple line is the fix cost. By using this principle, we can apply the demand-supply curve to real world business more practically.

I will further explain why I use -MPC for MB and Wage rate for MC here. MPC is the marginal propensity to consume for gaining the income. Minus sign is for downward demand curve. The formula is:

$$MPC = \frac{dC}{dY}$$

Y means income, and we can use Q instead of Y from the Fisher equation  $MV=PQ=PY$ . Thus, C is the unit consumption. We can also derive utility from the above formula.

$$\frac{MU}{P} = \frac{MU_M}{P_M} = \lambda = \text{constant}$$

$$P = C = -MPC * Q$$

Thus,

$$MU = -MPC * Q * \lambda$$

$$TU = \int MU dQ = -\frac{1}{2} MPC * Q^2 * \lambda$$

Thus, the total utility is a parabola curve with its downward opening. And, MU is a downward straight line. These fulfill the real world observation. Then, I will explain 'MC=wage rate'.

Let

$$\frac{dC}{dQ} = \frac{d(FC + NC + VC)}{dQ} = \frac{dVC}{dQ} = MC$$

(C is the cost per unit good)

$$TVC = VC * Q = w * Q * L$$

(W is wage piece rate)

$$\frac{dVC}{dQ} = MC = w * d(L/Q) = w/MP = w'$$

I call this  $w'$  real or practical wage rate which stands for marginal cost. MP rises first and goes down later, so marginal cost is a up-opening parabola curve.

In addition, the total variable cost curve can be deducted.

$$TVC = \int VC = \int MC * Q = \frac{1}{2} MC * Q^2$$

Here, I will try to deduct production function which is analog to Newton's mechanics. The net profit for company is total revenue minus total cost. So,

$$\pi = P'Q' - (F_c + N_cQ + \frac{1}{2}M_c(Q - Q_0)^2)$$

$$N_c = \frac{1}{2}M_cQ_0^2$$

Here,  $F_c$  is the fixed cost(asset),  $N_c$  is the material natural substance cost,  $M_c$  is marginal cost which is the same as labor cost, and  $Q_0$  is the minimal amount needed to produce(economic scale). Thus,

$$Q_0 = \sqrt{\frac{2N_c}{M_c}}$$

$$T_c(Q) = \frac{1}{2}M_cQ^2 + (2N_c - \sqrt{2N_cM_c})Q + F_c$$

This is the total cost function. And the below production function is  $F^{-1}(x)$  of the total cost function:

$$Q = \frac{-(2N_c - \sqrt{2N_cM_c}) \pm \sqrt{(2N_c - \sqrt{2N_cM_c})^2 - 2M_c(F_c - T_c)}}{M_c}$$

We can also calculate the consumption via the D-S equilibrium curve:

$$\text{Consumption} = \frac{1}{2}MPC * Q'^2$$

Consumer's income is:

$$\text{Income} = \frac{1}{2}Q'^2$$

Saving is:

$$\text{Saving} = \frac{1}{2}MPS * Q'^2 = \frac{1}{2}(1 - MPC) * Q'^2$$

Autonomous consumption, not shown here, is from pre-existing wealth.